

MOSH and MOAH in packaging

Analytical services in Germany

TÜV Rheinland LGA Products - Information

April 2024

A possible input of mineral oils into food is diverse and extends over all stages of production (raw materials, storage and transport) of packaging materials. The main sources of MOSH/MOAH contamination are adhesives, recycled papers and printing inks, and the packaging made from them.

In the European Union, attempts are currently being made to regulate the use of MOSH/MOAH in two directions. France has implemented law LOI n° 2020-105 on "Circular Economy and the Fight Against Waste" by banning the use of mineral oil-based printing inks for printing on packaging. The intention is a reduction the possible input of MOSH/MOAH compounds into the recycling stream of paper and cardboard.

On the other hand, there are plans for limitation of MOSH/MOAH transfer from recycled packaging to food stuff. To this end, an amendment to the German Commodity Ordinance was planned. This was initially rejected by the German Bundesrat pending further evaluation by EFSA.

For details on the French Arrêté du 13 avril 2022¹ "Various adaptation provisions in connection with extended producer responsibility" and the conditions for the ban on mineral oils in packaging and printing inks, please refer to our customer information from June 2022². Here we have presented in detail the contents of the law, which came into force on January 1, 2023.

LEGISLATION IN FRANCE

The substances affected by the ban on the use of mineral oils are:

- Aromatic mineral oil hydrocarbons (MOAH) with 1 to 7 aromatic rings;
- Saturated petroleum hydrocarbons (MOSH) with 16 to 35 carbon atoms.

Until December 31, 2024, the ban on the use of (MOAH) in printing ink with more than 1 % applies.

From January 1, 2025, the ban applies to the use of mineral oils:

- For MOAH, if the printing ink contains more than 0.1 % or the mass concentration of compounds with 3 to 7 aromatic rings in the printing ink is more than 1 ppm (mg/kg);
- For MOSH, the limit value in the printing ink is 0.1 %.

¹ <https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000045733481>

² <https://www.tuv.com/regulations-and-standards/en/france-order-on-the-ban-of-use-of-mineral-oils-in-packaging-and-printed-materials-distributed-to-the-public.html>

MATERIALS AFFECTED

The law only applies to printing inks itself used for paper and cardboard packaging. Other printed packaging, e.g. printed plastic films or coated packaging, are not mentioned separately in the scope of application. However, the present law leaves room for interpretation.

Based on the text of the law, instruction manuals (frequently loaded according to available results), ID stickers for product identification, enclosed information and warranty cards are also part of the packaging as packaging components and must comply with the requirements, provided they are printed paper/cardboard.

Commercial packaging such as export cartons and outer cartons that are not distributed to the customer are not regulated until 2025.

DETERMINATION OF MOSH AND MOAH

Testing for the requirements set out in Article 2 of the Arrêté du 13 avril 2022 should be carried out on printing inks as a matter of priority. Since the limit values refer to the printing ink, only this measurement result can be evaluated with certainty. However, according to the law, printed materials can also be examined.

The following tests are possible for the application area of printing inks for packaging:

Valid until December 31, 2024

Substance	Aromatic Rings	Limit	Cost (Euro)	Testing time
MOAH	1-7 Aromatic Rings	1 % (10.000 mg/kg)	275,-	10 Working days

Sample size 10 g

(The test report additionally reports the measurement result for MOSH).

Valid from January 1, 2025

Substance	Aromatic Rings and C-Atom	Limit	Cost (Euro)	Testing time
MOAH	1-7 Aromatic Rings	0.1 % (1000 mg/kg)	690,-	20 Working days
MOAH	3-7 Aromatic Rings	0.0001% (1 mg/kg)		
MOSH	16-35 C-Atoms	0.1 % (1000 mg/kg)		

Sample size 10 g

Testing on printing inks

To report and evaluate conformity to the law, liquid printing inks should be examined. If it is not possible to obtain the printing ink from the printer, to test the printed materials is also possible. However, the results are less informative and leave room for interpretation, which will be presented later in this document.

Even if the printing ink is basically free of mineral oil, small amounts of MOSH/MOAH may be present in the ink, originating from impurities in the raw material or from the production process. For example, metallic effect prints may contain particles that have been ground using mineral oils.

TESTS ON PRINTED PAPER / BOARD / CARDBOARD

The tests on printed material are more complex to evaluate and perform because paper, cardboard and carton may contain MOSH/MOAH from recycling processes. This is permitted under French law. In case of conspicuous findings on printed paper/cardboard, further analyses are required.

Mineral oils have the property to disperse in paper or cardboard, e.g. to migrate from the printing layer into the base material and vice versa. With this in mind, it is useful to examine a sample of unprinted paper/cardboard for any follow-up analysis that may be required.

Furthermore, when examining the dry ink layer, it should be noted that no direct conclusion can be drawn from the dry ink as to the MOSH/MOAH content in the liquid ink, since a considerable proportion of the mineral oils already evaporates during the drying process.

The details of the resulting evaluation options are presented in the following section.

EVALUATION OF THE RESULTS OF PAPER / BOARD / CARDBOARD

In order to limit the findings for printed paper/cardboard as closely as possible to the printing ink, only the thin, upper printed layer is examined, which contains as much printing ink and as little paper/cardboard as possible. Nevertheless, the test result then obtained cannot always be unambiguously related to the printing ink, and follow-up tests may be necessary.

Various scenarios are possible:

Result	Statement in relation to limit value valid until 31.12.2024
No findings (MOAH < 4 mg/kg)	The result of MOAH indicates that the use of a printing ink with MOAH > 10,000 mg/kg (1 %) could not be detected.
Positive findings (MOAH > 4 mg/kg)	No statement on the mineral oil content of the printing ink possible. The detected mineral oil content may originate from the printing ink or the recycled material used. Further investigation of the non-printed material or the paper/board without the printed layer is required.
Results of the examination of the <u>non-printed material</u>	
Findings similar to the content of the printed sample	It can be assumed that the finding is due to the use of contaminated waste paper. Even on the part of an authority, proof to the contrary is not possible. It is only possible to reliably exclude the use of an unauthorized printing ink by examining the printing ink.
Findings significantly lower than the content of the printed sample	It is likely that the finding of MOAH is due to the use of mineral oil-based ink.

POSSIBILITIES FOR IMPLEMENTATION

We recommend informing the contracted printing companies in all cases, e.g. by means of our previous customer information on this subject.

The printing company can determine the permissible printing inks (free of MOSH/MOAH within the meaning of the Arrêté du 13 avril 2022) on the basis of the printing inks technical data sheets (TDS) and in consultation with the printing ink manufacturer. To obtain information on trace levels of mineral oils that are unintentionally introduced is not possible.

These documents, such as TDS of the printing inks or confirmations of the printing ink manufacturers, should be available if possible in order to be able to prove the conformity of the printing inks used, e.g. in the case of inquiries from the authorities. A declaration of conformity is not required here. It is becoming apparent that such a declaration will be required in the future as part of the planned EU Packaging Regulation.

As part of the duty of care as a manufacturer/importer or distributor, random checks should be carried out on the printing inks used or the printed materials, particularly if documents cannot be obtained with certainty or there are doubts about the plausibility of the documentation.

Further information on current legal changes can also be found on our homepage at www.tuv.com or <https://www.tuv.com/regulations-and-standards/en/>.

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